

PATENT ABSTRACTS OF JAPAN

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(54) REFLECTING FILM FOR SURFACE LIGHT SOURCE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a reflecting film for surface light source used in the backlight mechanism of the liquid crystal display of a notebook-type personal computer or word processor using a liquid crystal element.

SOLUTION: The reflecting film chiefly comprises a polyester resin layer containing many microvoids and has ≤2% total light transmittance.

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CLAIMS

[Claim(s)]

[Claim 1] The reflective film for the surface light sources which consists of a polyester system resin layer which mainly contains many detailed cavities, and is characterized by total light transmission being 2% or less.

[Claim 2] The reflective film for the surface light sources according to claim 1 characterized by having a concealment layer in the field which becomes an incident light side, and the field of the opposite side.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the reflective film for the surface light sources used for the back light device of the liquid crystal display using liquid crystal devices, such as a computer of a notebook mold, and a word processor, in detail about the reflective film for the surface light sources.

[0002]

[Description of the Prior Art] In recent years, as indicating equipments, such as a computer of a notebook mold, and a word processor, thin-shape-izing is possible and the liquid crystal display using the liquid crystal device which moreover has the back light device in which an image is legible is used. Many edge light methods which put side by side a linear light source like fluorescence tubing in the end section of the light guide plate of translucency are used for such a back light device. In the case of such an edge light method, there is much what constitutes the surface light source as covers one field of a light guide plate with an optical diffusate partially and covers the whole surface of the field with a reflector further.

[0003] There was a foaming white film which is indicated by an aluminum plate like a JP,62-286019,A publication as above reflectors, a metallic reflection plate like a JP,4-22755,U publication, the thing that prepared the silver thin film in a film front face like a JP,8-114798,A publication or JP,3-256090,A, and the JP,8-16175,B official report. Especially, in the back light device of an edge light method, many light weights and small foaming white films of directional sensitivity of a target are comparatively used as a reflecting plate now. However, when the conventional foaming white film was built into back light equipment since concealment nature is inferior although it had the outstanding property that a light weight and directional sensitivity of a target are small, parts, such as a crosspiece of the case of the plastics nature incorporating the part and liquid crystal display of a metal frame for fixing a liquid crystal display component, were transparent, and it appeared, and had the problem of spoiling the grace as a liquid crystal display.

[0004]

[Problem(s) to be Solved by the Invention] This invention aims at obtaining the high reflective film for the surface light sources of concealment nature, holding the property which was excellent in the foaming white film.

[0005]

[Means for Solving the Problem] This invention has the next configuration.

(1) The reflective film for the surface light sources which has a polyester system resin layer containing many cavities detailed at least, and is characterized by total light transmission being 2% or less.

(2) The reflective film for the surface light sources given in (1) characterized by having a concealment layer in the field which becomes an incident light side, and the field of the opposite side.

[0006] In addition, in this invention, especially the thickness of a "film" is not limited but contains the so-called "sheet."

[0007]

[Embodiment of the Invention] The reflective film for the surface light sources of this invention has a polyester system resin layer containing many cavities detailed at least, and total light transmission is 2% or less. When it excels in concealment nature and includes in back light equipment by making total light transmission into 2% or less, it can prevent that parts, such as a crosspiece of the case of the plastics nature incorporating the part and liquid crystal display of a metal frame for fixing a liquid crystal display component, are transparent, and it is visible.

[0008] The base material used for the reflective film for the surface light sources of this invention has a polyester system resin layer containing many cavities detailed at least. If the above-mentioned polyester system resin layer consists of polyester system resin and many detailed cavities are contained, especially the configuration will not be limited, for example, polyester system resin will be constituted from immiscible thermoplastics (b) to the polyester system resin (a) used as the base, and this polyester system resin (a), and the thing which makes a cavity discover with thermoplastics (b) will be mentioned.

[0009] The polyester obtained as polyester which constitutes the above-mentioned polyester system resin (a) by carrying out the polycondensation of aromatic series dicarboxylic acid, such as a terephthalic acid, isophthalic acid, and naphthalene dicarboxylic acid, or the ester of those, and the glycols, such as ethylene glycol, a diethylene glycol, 1,4-butanediol, and neopentyl glycol, is mentioned. As a typical thing of this polyester, polyethylene terephthalate, polyethylene butylene terephthalate, polybutylene terephthalate, polyethylene -2, 6-naphthalate, etc. are illustrated. Although these polyester is not cared about, of course even if it may be homopolymers or is the copolymer which made the 3rd component other than the constituent of the above-mentioned polyester copolymerize in this invention Anyway, an ethylene terephthalate unit, a butylene terephthalate unit, Or it is desirable still more desirable that the ratio which ethylene -2 and 6-naphthalate unit occupy is more than 70 mol % to all configuration units, and more than 80 mol % and the polyester which is more than 90 mol % especially preferably are good.

[0010] A back polycondensation can be carried out or the above-mentioned polyester can also be manufactured by the approach of having carried out the ester exchange reaction for the alkyl ester and the glycol of aromatic series dicarboxylic acid besides the approach of carrying out the direct reaction of aromatic series dicarboxylic acid and the glycol to which the polycondensation of the diethylene glycol ester of aromatic series dicarboxylic acid is carried out.

[0011] it will not be limited, especially if it is immiscible, mix in homogeneity in the state of distribution into polyester system resin (a), and immiscible thermoplastics (b) is boiled by extension of a film etc., causes exfoliation by the interface with polyester system resin (a) and makes a cavity discover to the polyester system resin (a) used as the base to the above-mentioned polyester system resin (a). Preferably, polystyrene system resin, polyolefine system resin, Pori acrylic resin, polycarbonate system resin, polysulfone system resin, cellulose system resin, etc. are mentioned. These can be used independently and also they can also be used for two or more sorts, compounding as occasion demands. Especially use of polyolefine system resin, such as polystyrene system resin, the poly methyl pentene, and polypropylene, is desirable especially.

[0012] Although the loadings to the polyester system resin (a) of the above-mentioned thermoplastics (b) are suitably set up according to manufacture conditions, such as the amount of porosi for which the above-mentioned polyester system resin layer obtained is asked, and physical properties, extension, etc., it is good that thermoplastics (b) is the 5 - 30-% of the weight range still more preferably to the resin constituent whole quantity which consists of polyester system resin (a) and thermoplastics (b) 3 % of the weight or more to less than 40% of the weight. If there are few amounts of cavities which the loadings of thermoplastics (b) generate as it is less than 3 % of the weight, the reflective engine performance, especially heat ray reflective engine performance of the reflective film for the surface light sources of this invention cannot improve easily and it becomes 40% of the weight or more on the other hand, the ductility at the time of manufacture will fall remarkably, and also thermal resistance, reinforcement, or nerve tends to fall.

[0013] As for thermoplastics (b), it is still more desirable to constitute from thermoplastics (b2) with larger surface tension (surface energy) than the above-mentioned thermoplastics (b1) immiscibly to both immiscible thermoplastics (b1), and the above-mentioned polyester system resin (a) and the above-mentioned thermoplastics (b1) to the above-mentioned polyester system resin (a).

[0014] By constituting thermoplastics (b) from two sorts of above thermoplastics (b1) and thermoplastics (b2) Thermoplastics (b2) also receives thermoplastics (b1) to thermoplastics (b1) serving as a "cavernous manifestation agent" which mainly demonstrates a cavernous manifestation operation. Since [immiscible and] surface tension is larger than thermoplastics (b1), It becomes the "dispersibility resin" which has the operation to which demonstrate effectively "a distributed operation" which carries out detailed distribution of the thermoplastics (b1) to polyester system resin (a) in addition to the cavernous manifestation operation over polyester system resin (a), as a result a detailed cavity is made to form in homogeneity.

[0015] Although the combination of the above-mentioned thermoplastics (b1) and thermoplastics (b2) will not be limited to both polyester system resin (a) especially if it is immiscible and is larger than plasticity resin (b1), the following is mentioned, for example. [of the surface tension (surface energy) of thermoplastics (b2)] As thermoplastics (b1), when polyolefine system resin, such as poly methyl pentene system resin, a polypropylene regin, and an annular olefin polymer, silicone system resin, etc. are used, it is desirable as thermoplastics (b2) to use the polyolefine system resin which denaturalized with polystyrene system resin, polycarbonate system resin, Pori acrylic resin, polyphenylene ether system resin, maleimide, a carboxylic acid, etc., polystyrene system resin, etc. Or when polystyrene system resin is used as thermoplastics (b1), it is desirable to use the polyolefine system resin which denaturalized with polycarbonate system resin, Pori acrylic resin, polyphenylene ether system resin, maleimide, a carboxylic acid, etc. as thermoplastics (b2). Furthermore, the above-mentioned thermoplastics (b1) and thermoplastics (b2) can use one sort of resin independently, respectively, and also can use two or more sorts of resin, mixing as occasion demands.

[0016] Although the loadings of thermoplastics (b1) and thermoplastics (b2) will not be limited especially if a desired porosi operation is acquired to polyester system resin (a), it is desirable preferably to make it become thermoplastics (b2) 0.01 – 20 weight sections to the thermoplastics (b1) 100 weight section. The minimum of the loadings of thermoplastics (b2) to the thermoplastics (b1) 100 weight section is still more preferably good the 0.02 weight section and to consider as the 0.1 weight section preferably especially, and the upper limit of the loadings of thermoplastics (b2) is [a minimum] still more preferably good 15 weight sections and to consider as 10 weight sections preferably especially.

[0017] The loadings of thermoplastics (b2) to the thermoplastics (b1) 100 weight section under in the 0.01 weight section If the operation which carries out detailed distribution of the thermoplastics (b1) as "dispersibility resin" is hard to be acquired and 20 weight sections are exceeded on the other hand Thermoplastics (b2) covers the great portion of thermoplastics (b1), and the cavity of the magnitude of a request — the cavity where die length is short is formed as compared with thickness — becomes is hard to be obtained. By making the blending ratio of coal of thermoplastics (b1) and thermoplastics (b2) into the above-mentioned range, thermoplastics with large surface tension (b2) serves as extent to which covering or the whole will be covered thinly partially and the effect of the adhesive property on the thermoplastics (b1) to polyester system resin (a) can disregard thermoplastics with small surface tension (b1). Therefore, the detailed dispersion effect of thermoplastics (b2) is effectively discovered, the detailed decentralization of the thermoplastics (b1) can be carried out into polyester system resin (a), and many long cavities can be obtained to thickness like the after-mentioned. In addition, the condition that especially the condition that thermoplastics (b2) covers thermoplastics (b1) in polyester system resin (a) is not limited, for example, a covering part and a non-covering part exist [shape / of a mesh] regularly, the condition that a covering part exists disorderly, the condition which covers the whole thinly, the condition that the further above-mentioned condition carries out two or more coexistence, etc. are mentioned.

[0018] When thermoplastics (b) is constituted from two sorts of above thermoplastics (b1) and

thermoplastics (b2), The loadings to the inside of the polyester system resin (a) of thermoplastics (b1) and thermoplastics (b2) Although what is necessary is just to set up suitably according to the property for which the reflective film for the surface light sources of this invention is asked especially the amount of porosity in a polyester system resin layer, the extension conditions at the time of the above-mentioned polyester system resin layer manufacture, etc. As opposed to the grand total of the polyester system resin (a), thermoplastics (b1), and thermoplastics (b2) which mainly constitute the above-mentioned polyester system resin layer It is good to make it the sum of the loadings of thermoplastics (b1) and thermoplastics (b2) serve as 5 – 25% of the weight of range still more preferably three to 30% of the weight preferably. If the amount of cavities which the sum of the loadings of thermoplastics (b1) and thermoplastics (b2) generates at the extension process at the time of the polyester system resin stratification in less than 3 % of the weight decreases, the reflection factor and light-scattering nature in a light field fall and it, on the other hand, exceeds 30 % of the weight, the ductility at the time of the polyester system resin stratification will fall remarkably, and also reinforcement or nerve may fall.

[0019] As for the above-mentioned polyester system resin layer, in this invention, it is desirable not to contain an inorganic particle substantially. If an inorganic particle exists in the above-mentioned polyester system resin layer, dispersion of the light in the inside of a polyester system resin layer will become strong too much, and absorption of light energy will become large.

[0020] In this invention, it is the range which does not check an operation of this invention if needed in a polyester system resin layer, and it is possible to make a fluorescent brightener, an antistatic agent, an ultraviolet ray absorbent, etc. contain as other components.

[0021] The reflective film for the surface light sources of this invention may be the multilayer structure more than two-layer [, such as having a surface and a main layer,], even if the subject part is the film of a monolayer. When considering as multilayer structure, it is good also as a configuration which consists of a polyester system resin layer containing many detailed cavities like the above-mentioned polyester system resin layer more than two-layer well also as a different configuration also considering each class as the same configuration in the range which does not check an operation of this invention.

[0022] As for the above-mentioned polyester system resin layer, it is desirable to make 0.6–1.3g /of apparent density into the range of 3 cm. Cavernous content of apparent density is [the thing of less than / 0.6g //cm / three] too high, the reinforcement of a polyester system resin layer falls, or it becomes easy to produce a crack, a wrinkle, etc. on a polyester system resin layer front face, and commodity value falls, the thing of the high density conversely exceeding 1.3 g/cm³ has too low cavernous content, and the reflection property of a desired light field is hard to be obtained.

[0023] In this invention, especially the formation approach of the polyester system resin layer which serves as a subject is not limited, but can use the film formation approach generally used. After mixing the ingredient which constitutes a base material, extruding from an extruder, leading to a dice and obtaining a non-extended sheet from the point of productivity as the film formation approach, the approach of extending this non-extended sheet in the biaxial direction is the most desirable. When considering a base material as a multilayer configuration, each class may be formed in coincidence, or it may form separately and a laminating may be carried out.

[0024] In the reflective film for the surface light sources of this invention, especially the approach of making total light transmission 2% or less is not limited, but the approach of carrying out the laminating of the polyester system resin layer containing many above detailed cavities more than two-layer and the approach of forming a concealment layer in the field which becomes an incident light side, and the field of the opposite side are mentioned.

[0025] When the reflective film for the surface light sources of this invention considers as the configuration which has a concealment layer, the configuration of the material of a concealment layer, the formation approach, etc. will not be especially limited, if the total light transmission of the reflective film for the surface light sources of this invention becomes 2% or less. For example, the approach of carrying out the laminating of the layer containing inorganic particles,

such as the approach of carrying out the laminating of the metal thin film layer, the approach of carrying out the laminating of the film which has a metal thin film layer, a calcium carbonate, titanium oxide, and a zeolite, etc. is mentioned to the field which becomes the incident light side of the above-mentioned polyester system resin film which serves as a subject, and the field of the opposite side. That what is necessary is just to choose these laminating approaches suitably by the configuration of a concealment layer, it is the range which does not check an operation of this invention, and you may have other layers, such as having an adhesive layer etc. between the polyester system resin layer which serves as a subject, and a concealment layer, or having a protective layer etc. outside in the pan of a concealment layer.

[0026] Especially the thickness of each class is not limited in the reflective film for the surface light sources of this invention.

[0027] Although the example of a trial and an example are used for below and the effectiveness of this invention is further shown in a detail, this invention is the range which is not limited to these and does not check an operation of this invention, and all the things to change are included in the technical range of this invention.

Total light transmission was measured using the hazemeter (Tokyo Denshoku industrial company make and model TC-H3DP) about the reflective film for the surface light sources of the measurement examples 1 and 2 of example test-method of trial (1) all light transmission, and the example 1 of a comparison.

[0028]

[Example] After it fed the constituent as shown in the example 1 following into the biaxial screw extruder and it carried out melting extrusion at 290 degrees C from T-dice, it was made to stick to a cooling roll kneader in static electricity, and the non-extended sheet was obtained by making it solidify. Next, after covering this non-extended sheet over the roll drawing machine and performing vertical extension 3.1 times at 80 degrees C, while increasing horizontal extension 2.6 times at 125 degrees C by the tenter, it extended 1.4 times at 220 degrees C by the tenter further. Then, the polyester system resin film (polyester system resin layer) with a thickness of 188 micrometers which has many cavities inside was obtained by performing 4% of relaxation heat treatment at 235 degrees C.

Polyethylene terephthalate resin (intrinsic viscosity: 0.62 dl/g)

74 % of the weight GP polystyrene resin (PS)

[The Mitsui Toatsu Chemicals, Inc. make, T575-57U] 25 % of the weight Maleimide denaturation polystyrene resin (M-PS)

[The Mitsui Toatsu Chemicals, Inc. make, NH1200] It applied to one field of 1 % of the weight, next the above-mentioned polyester system resin film so that a binder (X395-270S-1: SAIDEN CHEMICAL INDUSTRY CO., LTD. make) might be set to 30g/m² by WET with a die coat method, and it was dried at 100 degrees C for 1 minute, and the binder layer was formed in it. Then, draw in piles the antioxidantizing stratification plane and the above-mentioned binder stratification plane of the silver vacuum evaporationo film (SAICHI industrial company make, Ag12) which has the configuration of the antioxidantizing layer of 1-micrometer thickness, the silver thin film layer of 50nm thickness, and the polyester film layer of 12-micrometer thickness between the rolls of two, they carry out heating sticking by pressure, it was made to paste up, and the reflective film for the surface light sources was obtained. In addition, it faced performing adhesion of an antioxidantizing stratification plane and a binder stratification plane between the rolls of two, and the pressure at the time of adhesion made 1000 N/cm further 50 degrees C of skin temperature of each roll with the linear pressure. The total light transmission of the obtained reflective film for the surface light sources was 1.3%.

[0029] the same constituent as example 2 example 1 was used as A lamination ingredient, after supplying each ***** separately to two sets of biaxial screw extruders, sticking within T-dice and carrying out melting push appearance at 290 degrees C from T-dice by using as B lamination ingredient the constituent shown below, it was made to stick to a cooling roll kneader in static electricity, and the non-extended sheet was obtained by making it fix. Next, after covering this non-extended sheet over the roll drawing machine and performing vertical extension 3.1 times at 80 degrees C, while increasing horizontal extension 2.6 times at 125 degrees C by the tenter, it

extended 1.4 times at 220 degrees C by the tenter further. Then, the laminated film of a two-layer polyester system resin layer (an A horizon and B horizon) was obtained by performing 4% of relaxation heat treatment at 235 degrees C. An A horizon is a cavernous content layer and a B horizon is a white concealment layer. In addition, thickness was an A horizon / B horizon =173 / 15 micrometers. The total light transmission of the obtained reflective film was 2.0%.

Same B lamination ingredient as the component of the polyester system resin layer of A lamination ingredient example 1 Polyethylene terephthalate resin (intrinsic viscosity: 0.62 dl/g) 75 % of the weight Titanium-dioxide particle [The product made from Fuji Titanium, TA-300] The polyester system resin film of a monolayer with a thickness of 188 micrometers which has many cavities inside 25% of the weight by the same approach as example of comparison 1 example 1 was obtained, and this was made into the reflective film for the surface light sources. The total light transmission of the obtained reflective film was 11.3%.

[0030]

[Effect of the Invention] The reflective film for the surface light sources of this invention is excellent also in concealment nature, holding the property which was excellent in the film which has many cavities, such as reflective engine performance.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the reflective film for the surface light sources used for the back light device of the liquid crystal display using liquid crystal devices, such as a computer of a notebook mold, and a word processor, in detail about the reflective film for the surface light sources.

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PRIOR ART

[Description of the Prior Art] In recent years, as indicating equipments, such as a computer of a notebook mold, and a word processor, thin-shape-izing is possible and the liquid crystal display using the liquid crystal device which moreover has the back light device in which an image is legible is used. Many edge light methods which put side by side a linear light source like fluorescence tubing in the end section of the light guide plate of translucency are used for such a back light device. In the case of such an edge light method, there is much what constitutes the surface light source as covers one field of a light guide plate with an optical diffusate partially and covers the whole surface of the field with a reflector further.

[0003] There was a foaming white film which is indicated by an aluminum plate like a JP,62-286019,A publication as above reflectors, a metallic reflection plate like a JP,4-22755,U publication, the thing that prepared the silver thin film in a film front face like a JP,8-114798,A publication or JP,3-256090,A, and the JP,8-16175,B official report. Especially, in the back light device of an edge light method, many light weights and small foaming white films of directional sensitivity of a target are comparatively used as a reflecting plate now. However, when the conventional foaming white film was built into back light equipment since concealment nature is inferior although it had the outstanding property that a light weight and directional sensitivity of a target are small, parts, such as a crosspiece of the case of the plastics nature incorporating the part and liquid crystal display of a metal frame for fixing a liquid crystal display component, were transparent, and it appeared, and had the problem of spoiling the grace as a liquid crystal display.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention aims at obtaining the high reflective film for the surface light sources of concealment nature, holding the property which was excellent in the foaming white film.

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MEANS

[Means for Solving the Problem] This invention has the next configuration.

(1) The reflective film for the surface light sources which has a polyester system resin layer containing many cavities detailed at least, and is characterized by total light transmission being 2% or less.

(2) The reflective film for the surface light sources given in (1) characterized by having a concealment layer in the field which becomes an incident light side, and the field of the opposite side.

[0006] In addition, in this invention, especially the thickness of a "film" is not limited but contains the so-called "sheet."

[0007]

[Embodiment of the Invention] The reflective film for the surface light sources of this invention has a polyester system resin layer containing many cavities detailed at least, and total light transmission is 2% or less. When it excels in concealment nature and includes in back light equipment by making total light transmission into 2% or less, it can prevent that parts, such as a crosspiece of the case of the plastics nature incorporating the part and liquid crystal display of a metal frame for fixing a liquid crystal display component, are transparent, and it is visible.

[0008] The base material used for the reflective film for the surface light sources of this invention has a polyester system resin layer containing many cavities detailed at least. If the above-mentioned polyester system resin layer consists of polyester system resin and many detailed cavities are contained, especially the configuration will not be limited, for example, polyester system resin will be constituted from immiscible thermoplastics (b) to the polyester system resin (a) used as the base, and this polyester system resin (a), and the thing which makes a cavity discover with thermoplastics (b) will be mentioned.

[0009] The polyester obtained as polyester which constitutes the above-mentioned polyester system resin (a) by carrying out the polycondensation of aromatic series dicarboxylic acid, such as a terephthalic acid, isophthalic acid, and naphthalene dicarboxylic acid, or the ester of those, and the glycols, such as ethylene glycol, a diethylene glycol, 1,4-butanediol, and neopentyl glycol, is mentioned. As a typical thing of this polyester, polyethylene terephthalate, polyethylene butylene terephthalate, polybutylene terephthalate, polyethylene -2, 6-naphthalate, etc. are illustrated. Although these polyester is not cared about, of course even if it may be homopolymers or is the copolymer which made the 3rd component other than the constituent of the above-mentioned polyester copolymerize In this invention Anyway, an ethylene terephthalate unit, a butylene terephthalate unit, Or it is desirable still more desirable that the ratio which ethylene -2 and 6-naphthalate unit occupy is more than 70 mol % to all configuration units, and more than 80 mol % and the polyester which is more than 90 mol % especially preferably are good.

[0010] A back polycondensation can be carried out or the above-mentioned polyester can also be manufactured by the approach of having carried out the ester exchange reaction for the alkyl ester and the glycol of aromatic series dicarboxylic acid besides the approach of carrying out the direct reaction of aromatic series dicarboxylic acid and the glycol to which the polycondensation of the diethylene glycol ester of aromatic series dicarboxylic acid is carried out.

[0011] it will not be limited, especially if it is immiscible, mix in homogeneity in the state of distribution into polyester system resin (a), and immiscible thermoplastics (b) is boiled by extension of a film etc., causes exfoliation by the interface with polyester system resin (a) and makes a cavity discover to the polyester system resin (a) used as the base to the above-mentioned polyester system resin (a). Preferably, polystyrene system resin, polyolefine system resin, Pori acrylic resin, polycarbonate system resin, polysulfone system resin, cellulose system resin, etc. are mentioned. These can be used independently and also they can also be used for two or more sorts, compounding as occasion demands. Especially use of polyolefine system resin, such as polystyrene system resin, the poly methyl pentene, and polypropylene, is desirable especially.

[0012] Although the loadings to the polyester system resin (a) of the above-mentioned thermoplastics (b) are suitably set up according to manufacture conditions, such as the amount of porosi for which the above-mentioned polyester system resin layer obtained is asked, and physical properties, extension, etc., it is good that thermoplastics (b) is the 5 – 30-% of the weight range still more preferably to the resin constituent whole quantity which consists of polyester system resin (a) and thermoplastics (b) 3 % of the weight or more to less than 40% of the weight. If there are few amounts of cavities which the loadings of thermoplastics (b) generate as it is less than 3 % of the weight, the reflective engine performance, especially heat ray reflective engine performance of the reflective film for the surface light sources of this invention cannot improve easily and it becomes 40% of the weight or more on the other hand, the ductility at the time of manufacture will fall remarkably, and also thermal resistance, reinforcement, or nerve tends to fall.

[0013] As for thermoplastics (b), it is still more desirable to constitute from thermoplastics (b2) with larger surface tension (surface energy) than the above-mentioned thermoplastics (b1) immisciblely to both immiscible thermoplastics (b1), and the above-mentioned polyester system resin (a) and the above-mentioned thermoplastics (b1) to the above-mentioned polyester system resin (a).

[0014] By constituting thermoplastics (b) from two sorts of above thermoplastics (b1) and thermoplastics (b2) Thermoplastics (b2) also receives thermoplastics (b1) to thermoplastics (b1) serving as a "cavernous manifestation agent" which mainly demonstrates a cavernous manifestation operation. Since [immiscible and] surface tension is larger than thermoplastics (b1), It becomes the "dispersibility resin" which has the operation to which demonstrate effectively "a distributed operation" which carries out detailed distribution of the thermoplastics (b1) to polyester system resin (a) in addition to the cavernous manifestation operation over polyester system resin (a), as a result a detailed cavity is made to form in homogeneity.

[0015] Although the combination of the above-mentioned thermoplastics (b1) and thermoplastics (b2) will not be limited to both polyester system resin (a) especially if it is immiscible and is larger than plasticity resin (b1), the following is mentioned, for example. [of the surface tension (surface energy) of thermoplastics (b2)] As thermoplastics (b1), when polyolefine system resin, such as poly methyl pentene system resin, a polypropylene regin, and an annular olefin polymer, silicone system resin, etc. are used, it is desirable as thermoplastics (b2) to use the polyolefine system resin which denaturalized with polystyrene system resin, polycarbonate system resin, Pori acrylic resin, polyphenylene ether system resin, maleimide, a carboxylic acid, etc., polystyrene system resin, etc. Or when polystyrene system resin is used as thermoplastics (b1), it is desirable to use the polyolefine system resin which denaturalized with polycarbonate system resin, Pori acrylic resin, polyphenylene ether system resin, maleimide, a carboxylic acid, etc. as thermoplastics (b2). Furthermore, the above-mentioned thermoplastics (b1) and thermoplastics (b2) can use one sort of resin independently, respectively, and also can use two or more sorts of resin, mixing as occasion demands.

[0016] Although the loadings of thermoplastics (b1) and thermoplastics (b2) will not be limited especially if a desired porosi operation is acquired to polyester system resin (a), it is desirable preferably to make it become thermoplastics (b2) 0.01 – 20 weight sections to the thermoplastics (b1) 100 weight section. The minimum of the loadings of thermoplastics (b2) to the thermoplastics (b1) 100 weight section is still more preferably good the 0.02 weight section

and to consider as the 0.1 weight section preferably especially, and the upper limit of the loadings of thermoplastics (b2) is [a minimum] still more preferably good 15 weight sections and to consider as 10 weight sections preferably especially.

[0017] The loadings of thermoplastics (b2) to the thermoplastics (b1) 100 weight section under in the 0.01 weight section If the operation which carries out detailed distribution of the thermoplastics (b1) as "dispersibility resin" is hard to be acquired and 20 weight sections are exceeded on the other hand Thermoplastics (b2) covers the great portion of thermoplastics (b1), and the cavity of the magnitude of a request — the cavity where die length is short is formed as compared with thickness — becomes is hard to be obtained. By making the blending ratio of coal of thermoplastics (b1) and thermoplastics (b2) into the above-mentioned range, thermoplastics with large surface tension (b2) serves as extent to which covering or the whole will be covered thinly partially and the effect of the adhesive property on the thermoplastics (b1) to polyester system resin (a) can disregard thermoplastics with small surface tension (b1). Therefore, the detailed dispersion effect of thermoplastics (b2) is effectively discovered, the detailed decentralization of the thermoplastics (b1) can be carried out into polyester system resin (a), and many long cavities can be obtained to thickness like the after-mentioned. In addition, the condition that especially the condition that thermoplastics (b2) covers thermoplastics (b1) in polyester system resin (a) is not limited, for example, a covering part and a non-covering part exist [shape / of a mesh] regularly, the condition that a covering part exists disorderly, the condition which covers the whole thinly, the condition that the further above-mentioned condition carries out two or more coexistence, etc. are mentioned.

[0018] When thermoplastics (b) is constituted from two sorts of above thermoplastics (b1) and thermoplastics (b2), The loadings to the inside of the polyester system resin (a) of thermoplastics (b1) and thermoplastics (b2) Although what is necessary is just to set up suitably according to the property for which the reflective film for the surface light sources of this invention is asked especially the amount of porosi in a polyester system resin layer, the extension conditions at the time of the above-mentioned polyester system resin layer manufacture, etc. As opposed to the grand total of the polyester system resin (a), thermoplastics (b1), and thermoplastics (b2) which mainly constitute the above-mentioned polyester system resin layer It is good to make it the sum of the loadings of thermoplastics (b1) and thermoplastics (b2) serve as 5 – 25% of the weight of range still more preferably three to 30% of the weight preferably. If the amount of cavities which the sum of the loadings of thermoplastics (b1) and thermoplastics (b2) generates at the extension process at the time of the polyester system resin stratification in less than 3 % of the weight decreases, the reflection factor and light-scattering nature in a light field fall and it, on the other hand, exceeds 30 % of the weight, the ductility at the time of the polyester system resin stratification will fall remarkably, and also reinforcement or nerve may fall.

[0019] As for the above-mentioned polyester system resin layer, in this invention, it is desirable not to contain an inorganic particle substantially. If an inorganic particle exists in the above-mentioned polyester system resin layer, dispersion of the light in the inside of a polyester system resin layer will become strong too much, and absorption of light energy will become large.

[0020] In this invention, it is the range which does not check an operation of this invention if needed in a polyester system resin layer, and it is possible to make a fluorescent brightener, an antistatic agent, an ultraviolet ray absorbent, etc. contain as other components.

[0021] The reflective film for the surface light sources of this invention may be the multilayer structure more than two-layer [, such as having a surface and a main layer,], even if the subject part is the film of a monolayer. When considering as multilayer structure, it is good also as a configuration which consists of a polyester system resin layer containing many detailed cavities like the above-mentioned polyester system resin layer more than two-layer well also as a different configuration also considering each class as the same configuration in the range which does not check an operation of this invention.

[0022] As for the above-mentioned polyester system resin layer, it is desirable to make 0.6–1.3g /of apparent density into the range of 3 cm. Cavernous content of apparent density is [the

thing of less than / 0.6g //cm / three] too high, the reinforcement of a polyester system resin layer falls, or it becomes easy to produce a crack, a wrinkle, etc. on a polyester system resin layer front face, and commodity value falls, the thing of the high density conversely exceeding 1.3 g/cm³ has too low cavernous content, and the reflection property of a desired light field is hard to be obtained.

[0023] In this invention, especially the formation approach of the polyester system resin layer which serves as a subject is not limited, but can use the film formation approach generally used. After mixing the ingredient which constitutes a base material, extruding from an extruder, leading to a dice and obtaining a non-extended sheet from the point of productivity as the film formation approach, the approach of extending this non-extended sheet in the biaxial direction is the most desirable. When considering a base material as a multilayer configuration, each class may be formed in coincidence, or it may form separately and a laminating may be carried out.

[0024] In the reflective film for the surface light sources of this invention, especially the approach of making total light transmission 2% or less is not limited, but the approach of carrying out the laminating of the polyester system resin layer containing many above detailed cavities more than two-layer and the approach of forming a concealment layer in the field which becomes an incident light side, and the field of the opposite side are mentioned.

[0025] When the reflective film for the surface light sources of this invention considers as the configuration which has a concealment layer, the configuration of the material of a concealment layer, the formation approach, etc. will not be especially limited, if the total light transmission of the reflective film for the surface light sources of this invention becomes 2% or less. For example, the approach of carrying out the laminating of the layer containing inorganic particles, such as the approach of carrying out the laminating of the metal thin film layer, the approach of carrying out the laminating of the film which has a metal thin film layer, a calcium carbonate, titanium oxide, and a zeolite, etc. is mentioned to the field which becomes the incident light side of the above-mentioned polyester system resin film which serves as a subject, and the field of the opposite side. That what is necessary is just to choose these laminating approaches suitably by the configuration of a concealment layer, it is the range which does not check an operation of this invention, and you may have other layers, such as having an adhesive layer etc. between the polyester system resin layer which serves as a subject, and a concealment layer, or having a protective layer etc. outside in the pan of a concealment layer.

[0026] Especially the thickness of each class is not limited in the reflective film for the surface light sources of this invention.

[0027] Although the example of a trial and an example are used for below and the effectiveness of this invention is further shown in a detail, this invention is the range which is not limited to these and does not check an operation of this invention, and all the things to change are included in the technical range of this invention.

Total light transmission was measured using the hazemeter (Tokyo Denshoku industrial company make and model TC-H3DP) about the reflective film for the surface light sources of the measurement examples 1 and 2 of example test-method of trial (1) all light transmission, and the example 1 of a comparison.

[Translation done.]

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely..
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

EXAMPLE

[Example] After it fed the constituent as shown in the example 1 following into the biaxial screw extruder and it carried out melting extrusion at 290 degrees C from T-dice, it was made to stick to a cooling roll kneader in static electricity, and the non-extended sheet was obtained by making it solidify. Next, after covering this non-extended sheet over the roll drawing machine and performing vertical extension 3.1 times at 80 degrees C, while increasing horizontal extension 2.6 times at 125 degrees C by the tenter, it extended 1.4 times at 220 degrees C by the tenter further. Then, the polyester system resin film (polyester system resin layer) with a thickness of 188 micrometers which has many cavities inside was obtained by performing 4% of relaxation heat treatment at 235 degrees C.

Polyethylene terephthalate resin (intrinsic viscosity: 0.62 dl/g)

74 % of the weight GP polystyrene resin (PS)

[The Mitsui Toatsu Chemicals, Inc. make, T575-57U] 25 % of the weight Maleimide denaturation polystyrene resin (M-PS)

[The Mitsui Toatsu Chemicals, Inc. make, NH1200] It applied to one field of 1 % of the weight, next the above-mentioned polyester system resin film so that a binder (X395-270S-1: SAIDEN CHEMICAL INDUSTRY CO., LTD. make) might be set to 30g/m² by WET with a die coat method, and it was dried at 100 degrees C for 1 minute, and the binder layer was formed in it. Then, draw in piles the antioxidant stratification plane and the above-mentioned binder stratification plane of the silver vacuum evaporation film (SAICHI industrial company make, Ag12) which has the configuration of the antioxidant layer of 1-micrometer thickness, the silver thin film layer of 50nm thickness, and the polyester film layer of 12-micrometer thickness between the rolls of two, they carry out heating sticking by pressure, it was made to paste up, and the reflective film for the surface light sources was obtained. In addition, it faced performing adhesion of an antioxidant stratification plane and a binder stratification plane between the rolls of two, and the pressure at the time of adhesion made 1000 N/cm further 50 degrees C of skin temperature of each roll with the linear pressure. The total light transmission of the obtained reflective film for the surface light sources was 1.3%.

[0029] the same constituent as example 2 example 1 was used as A lamination ingredient, after supplying each ***** separately to two sets of biaxial screw extruders, sticking within T-dice and carrying out melting push appearance at 290 degrees C from T-dice by using as B lamination ingredient the constituent shown below, it was made to stick to a cooling roll kneader in static electricity, and the non-extended sheet was obtained by making it fix. Next, after covering this non-extended sheet over the roll drawing machine and performing vertical extension 3.1 times at 80 degrees C, while increasing horizontal extension 2.6 times at 125 degrees C by the tenter, it extended 1.4 times at 220 degrees C by the tenter further. Then, the laminated film of a two-layer polyester system resin layer (an A horizon and B horizon) was obtained by performing 4% of relaxation heat treatment at 235 degrees C. An A horizon is a cavernous content layer and a B horizon is a white concealment layer. In addition, thickness was an A horizon / B horizon =173 / 15 micrometers. The total light transmission of the obtained reflective film was 2.0%.

Same B lamination ingredient as the component of the polyester system resin layer of A lamination ingredient example 1 Polyethylene terephthalate resin (intrinsic viscosity: 0.62 dl/g)

75 % of the weight Titanium-dioxide particle [The product made from Fuji Titanium, TA-300] The polyester system resin film of a monolayer with a thickness of 188 micrometers which has many cavities inside 25% of the weight by the same approach as example of comparison 1 example 1 was obtained, and this was made into the reflective film for the surface light sources. The total light transmission of the obtained reflective film was 11.3%.

[Translation done.]